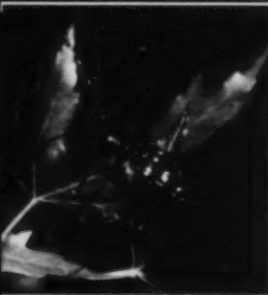


State of the Forest Report **2006**



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State of the Forest Report 2006



Minister of Natural Resources of the Province
of Ontario

**To his Honour
The Lieutenant-Governor of the
Province of Ontario**

May it please your Honour

The undersigned begs respectfully to present to your
Honour the State of the Forest Report, 2006

David Ramsay
Minister

March, 2007

acknowledgements.

Firstly we thank the many participants in the technical review of the sustainable forest management indicators. The review was essential for proceeding with this second state of the forest report for Ontario. Next, many of the dedicated Local Citizens' committee members made an extra effort by taking time to complete surveys analyzed for inclusion in this report. Furthermore, the MNR forest resource inventory and district office staff, and the staff of forest resource licensees must be given credit for making this report possible through the flow of information that is here compiled. For efforts during report production many individuals' efforts are deserving of acknowledgement for reviewing portions of the report and there are those who facilitated reviews by staff under their management. Phemie Hunter and Pat Fitzsimmons provided office support. Carmen Mwaui Design desktop published the printed summary report. Larry Watkins desktop published the portable document format (PDF) version of the report and a big due special thanks for graphics and maps in the report.

Notwithstanding the contributions of all the named and unnamed individuals grouped above, the following individuals contributed directly to the form and content of the State of the Forest Report, 2006 (affiliation was the Ontario Ministry of Natural Resources at the time of contribution unless indicated otherwise):

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State of the Forest Report 2006

The *State of the Forest Report, 2006* (SOFR) is a lengthy document and is included in full volume on the attached CD and at www.mnr.gov.on.ca. This summary presents an overview of the content of that report and the important conclusions

contents.

- 02 Foreword
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- 16 Criteria and Indicators
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- 28 Current and Pending Challenges



2006

foreword.



Ken Armson R.P.F. graduated in forestry from the Faculty of Forestry, University of Toronto in 1951 and taught forest soils and silviculture at the Faculty for 26 years. Following the publication of his report, Forest Management in Ontario in 1976, he left the Faculty in 1978 and joined the Ontario Ministry of Natural Resources to negotiate what became the Forest Management Agreements. He served as Chief Forester and Provincial Forester until his retirement

in 1989. He had a major role in the Environmental Assessment of Timber Management on Crown Lands in Ontario (1988-92) as both witness and advisor for the Ministry of Natural Resources. He is the author of Forest Soils: Properties and Processes (1977), Canadian Forests – a primer (1999), Ontario Forests: a historical perspective (2001), and over a hundred scientific papers and articles, including, as primary author the "History of Reforestation in Ontario" in Regenerating the Canadian Forest (2001). From 1989 to the present he has been engaged as a consultant by governments, forest companies, and forest industry associations. Currently, he is writing a history of the Victoria Harbour Lumber Company and its founder John Waldie.

It is generally accepted that those who are responsible and accountable for public resources should report periodically on their stewardship. Since Confederation in 1867 when Ontario became responsible for its public forest lands the record of reports has been sporadic and incomplete for a variety of reasons. A main reason has been the way Ontario's citizens and governments have viewed their forests. For many decades they were viewed as land for

settlement and the timber as a major source of government revenue. Annual reports of the agencies responsible for Ontario's public forests beginning with the Department of Lands Forest and Mines (1906) have provided various types and levels of information but no consistent record of the state of the forest.

It was not until the 1920s with the advent of trained foresters that the results of early forest surveys were published. More than 30 years elapsed until the early 1960s when

more detailed reporting of timber harvesting and silvicultural practices involving regeneration, protection and maintenance of public forests became regularized. Unfortunately, such reports although publicly available, were essentially statistical summaries with little to no descriptive text and therefore largely incomprehensible to a lay person.

With the initiation of Forest Management Agreements in 1980, objective audits and five-yearly reports were required for each agreement forest. Regular reports on the forest appeared but on a piecemeal basis and again in a format that was not user friendly for the general public and focused on the timber resource. In the 1990s the concept of sustainable development provided by the Brundtland Commission Report, *Our Common Future* (1987), gave rise to a major series of discussions on its application to forests and forest resources. Canada, in the Montréal Process, provided a lead role in developing the ways in which such sustainability could be assessed using Criteria and Indicators (C&I) of sustainability for forest values. The inclusion of perceived or intrinsic values whose assessment and related methodologies had not been well-developed was and often remains difficult to deal with. There became a need to have measures that can be assessed objectively by agreed-to methodologies.

When considering the state of the forest, the first questions that most persons will have are, "Has the forest changed?" and "How has it changed?" While the questions are simple, the answers provided are not.

Extensive hearings in the Environmental Assessment of Timber Management on Crown Lands in Ontario began in 1988 and culminated in the Board's Decision in 1994. That document dealt with many of the issues of the day that have continued to the present such as clearcutting and the use of pesticides, and set out a number of requirements for the Ministry of Natural Resources to be met on a specified time frame. One of these was that the Ministry report every five years on the state of the forest. In 1995 new legislation, the *Crown Forest Sustainability Act*, enshrined in policy the principle of sustainable forest management (SFM). The first State of the Forest Report (2001) has now been followed by this volume.

When considering the state of the forest, the first questions that most persons will have are, "Has the forest changed?" and "How has it changed?" While the questions are simple the answers provided are not. What are the measures of change? The use of criteria and related indicators of SFM has highlighted the fact that, depending on the forest attribute or value assessed, the time frame over which significant changes may occur can be quite different – decades to days. As with the historical approaches, the new indicator methodologies and categorization are subject to change as scientific knowledge and experience accumulate. This report

stresses the importance of such influences. The forest inventory of timber species is an example of such changes. Despite these qualifications, it is clear that the two questions asked – whether or not the forest has changed and in what way can have straightforward answers. Yes, it has changed but not significantly and the changes can be explained.

Communicating the state of the forest to the public has always been a challenge. First, the extent of the forest of Ontario is so large – that to quantify it in a meaningful way for seasoned resource managers, let alone the public, is a challenge. To relate the on-the-ground nature of the forest environment to socioeconomic implications makes the task even more daunting, especially since the Ministry acknowledges that it is still on a learning curve. Some years ago the E.B. Eddy Company (now Domtar) produced over a five-year period (1993–1998) a series of easily comprehended reports (*A Question of Balance*) on their sustainable forestry and manufacturing activities using the criteria and indicators of that time. It is a model that might be revisited as it may better reflect the intent of the Environmental Assessment Board's Decision in 1994. The Eddy Forest report closely linked environmental measures with socioeconomic consequences. The criteria and indicator approach in this and the previous State of

the Forest Report considers each value more or less in isolation, one at a time, although recognizing interconnections. This poses a challenge to find ways of reporting in a more integrated manner. I can't stress enough how difficult it is to measure the forest and its many attributes. Forests cover 71 million hectares (66% of Ontario's land) ranging from the southern forests in southwestern Ontario with their Carolinian species to the forests of black spruce and willow of the northern taiga. It has to be emphasized that the area of production Crown forest as defined in the environmental assessment is only 24.9 million hectares, 22 million of which is available forest for timber production and of that only approximately 19 million are operable due to various constraints. Thus of the total provincial forest of 71 million hectares, just 19 million or 27% are available for provincial forest management for timber.

The practice of forest management on the Crown's forests is undertaken by forest resource licensees, primarily forest companies. Together with fires and insects, industrial harvesting activities are the main disturbances

Foreword. | continued

occurring in the forest. Although areas affected by fire and insects vary considerably they consistently affect much larger areas than harvesting. Interestingly, data is presented showing over a period of 137 years since Confederation that only approximately 10.9 million hectares or 9% of Ontario's productive forest lands in the Area of the Undertaking (AOU – the forest lands subject to the Environmental Assessment Board's decision of 1994) and south have been subject to some form of commercial timber harvesting. Compare this to estimates of 14 million hectares affected by the forest tent caterpillar in 2001, 360,000 hectares by the spruce budworm in 2003, and the area burned in 1996 was close to 300,000 hectares. This means that our forests have been constantly undergoing disturbance and therefore have been changing continuously. Yet the forest has regenerated despite these disturbances and in most instances because of them. To the key question, "Is the forest of Ontario regenerating after harvesting, fire and insects?" Professionals agree the answer is an unequivocal "yes," but may debate the projected nature of the resultant forest ecosystem. Forecasting the future development of any forest ecosystem is primarily based on previous scientific studies and observations over time of

similar forest systems, but for any specific forest there is always a risk and uncertainty about what factors – climate, biological, or human may come into play over time. There is a time lag between the disturbance and when the regeneration is assessed to determine if it meets a Free-to-Grow (FTG) standard. These standards reflect specifications such as desired species, density, size and freedom from competing vegetation. Ideally, all disturbed areas should be assessed after a prescribed lapse of years, often five to ten, depending on the nature of the disturbance, site and growing conditions. This report makes it abundantly clear that a significant portion of the disturbed areas that are eligible for FTG assessment have not been surveyed. The gap in FTG assessment must be remedied for future reports if they are to categorically answer the question as to whether the forest is regenerating. One of the ways of regenerating the forest, particularly where harvesting has taken place is by planting seedlings. The purpose of a foreword is not to summarize the contents of this report but there are a number of items that warrant mentioning. The *State of the Forest Report* (2006) notes many accomplishments. For example, 98% of all seedlings outplanted came from improved seed from first generation seed orchards; wild turkey, a species that was extirpated in Ontario in the early 1900s and was reintroduced in 1984, now numbers approximately 80,000 birds that extend over a much larger area than

their estimated historic range; surveys conducted in 2001 and 2004 show that members of the public considered the forest management planning process fair and objective.

However, this is only the second comprehensive *State of the Forest Report*. Given the complexity and extent of both the forest and the nature of the values and uses it is expected to provide to the people of Ontario, it has to be acknowledged that simple definitive answers to many questions about the forest cannot be provided. The effort invested in the report makes it clear that there is a serious attempt by those responsible for the management of the forest to improve our knowledge and build on it so that increasingly we are all better informed about the state of Ontario's forests.

Forest timber growth is documented in several ways, other than by area, somewhat analogous to the manner in which any capital asset might be described. The growing stock or volume of timber is the capital and the mean annual increment (m.a.i.) is the interest; the rate of interest is measured in growth per unit area per year ($m^3/ha/yr$). Over time, the effect of timber management should be to increase the m.a.i. while at the same time maintaining, if not increasing the growing stock. Given the lack of consistency in data and the relatively brief period of 10 years that the two state of forest reports have dealt with, no significant changes are apparent.

It is clear that if consistent reliable data are desired then greater resources and improved methodologies will have to be employed. If it is incumbent for those responsible for the stewardship of Ontario's forests and their resources to report to their owners, it is equally incumbent on the owners, the people of Ontario and the government representing them to make available the necessary resources so that those charged with management and monitoring can provide meaningful data and information.

One of the interesting subject areas included in this report is assessing Ontario's contributions to global ecological cycles. As part of Canada's commitment to the Kyoto Protocol the report gives some indications of the net carbon balance of Ontario's forests and CO₂ emissions along with other related indicators. It is worth noting that, historically, prior to European settlement carbon losses due to natural fires would have been much greater than those due to present-day harvesting and forest fires combined, not only because of the extensive nature of those fires, but also because the harvested wood used in construction, furniture, and other products are essentially long-term storage banks of carbon.

The report confirms the forest industry is still the backbone of Ontario's forest economy and at the same time notes the difficulty in measuring the actual share of the economy to attribute to other forest values. One thing

to watch is that while harvest levels are still less than the available and sustainable timber supply, the areas and volumes of such timber have been declining for several reasons. Readers will note the profitability of the forest industry is variable depending on the sector; sawmill and paper sectors are generally decreasing and the veneer, plywood and engineered wood products increasing. In general, value-added forest products have demonstrated a consistent increase in contribution to the economy for all but the last two years of the period 1993-2002 together with a concomitant increase in employment.

The *State of the Forest Report* provides little detailed information about privately owned productive forest lands which comprise 6.6 million hectares and are a major landscape feature of southern Ontario. Although the report discusses the government programs such as the Managed Forest Tax Incentive Program and the Ontario Stewardship program which provide incentives and some assistance to private forest owners, little comprehensive information about these forests and their composition is provided. Data from licensed wood conversion facilities, mainly sawmills, indicate that about three to four million cubic metres of timber are processed from private forests and this is probably an underestimate.

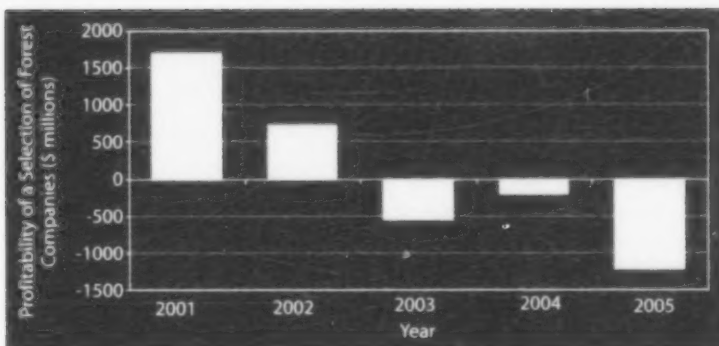
This second *State of the Forest Report* illustrates how important it is to maintain

continuity in documenting key information about specific measures not only of the forest itself but also of the major activities and disturbances that affect the forest ecosystem. These can then be seen in the proper time-related sequence so that the reader can have a sense of the changes that are occurring, their magnitude, intensity, frequency and distribution. This second report also provides the reader with a sense of the complexity in demonstrating sustainability using the internationally accepted C&I for the various components of the forest ecosystem and the social and economic aspects they are related to in our society. Too often our forests are viewed monocularly as static entities in which both human and non-human activities and interventions are treated simplistically in terms of cause and effect. The report clearly disabuses a reader of any such approach and illustrates the importance of recognizing the interplay that exists between components of the forest ecosystem which are often separated out for convenience of study and reporting. In so doing it places emphasis on the interdependence between ecological, economic and social processes that occur and demonstrates the importance of the forest to the people of Ontario.

Overview of the report.

The Ontario Ministry of Natural Resources (hereafter called the Ministry) is the steward of Ontario's provincial parks, forests, fisheries, wildlife, mineral aggregates and Crown lands and waters. Together the Crown lands and waters make up 87% of the total area of the province. This is a responsibility which the Ministry manages through a diverse legislative mandate and an array of programs. The Ministry's mission is to manage Ontario's natural resources in

an ecologically sustainable way to ensure that they are available for the enjoyment and use of future generations. In doing so, the Ministry contributes to the environmental, social and economic well-being of the people of Ontario, meeting not only today's needs, but also ensuring these resources are available for future generations. The *State of the Forest Report* reports on the status of sustainable forest management in Ontario.



Changing Economic Situation

The reporting period for this report is April 1999 to March 2004. The economic situation changed rapidly from 2003 to 2005, significantly impacting the forest industry. Many previously profitable operations became unprofitable. In addition there were numerous mill closures; 1.73 million metric tonnes of paper-making capacity (23%) and 0.39 billion board feet of lumber-making capacity (10%) closed. This led to an employment loss estimated at 5,700 jobs by April 2006. Individuals should keep this significant event, that occurred outside of the reporting period, in mind as they read the report.

This is Ontario's second state of the forest report. The reporting period for the report is April 1999 to March 2004. Data are derived from various sources, including the provincial annual report(s) on forest management. This report also describes long-term data trends using information which may originate from outside of the reporting period. In addition, where data and/or information is available and is more recent than the March 2004 reporting cut-off date, then it has been used to enhance trend analysis and to improve the utility of the report.

This second Ontario state of the forest report addresses multiple reporting requirements. The report addresses the requirement in the *Crown Forest Sustainability Act* (CFSA) for the Minister of Natural Resources to report every five years

This is Ontario's second
state of the forest report.



on the state of Crown forests. This report addresses Condition 33 of MNR's *Class Environmental Assessment Approval for Forest Management on Crown Lands in Ontario* (the EA Approval). Condition 33 outlines the content requirements for the SOFR under the EA Approval. The report also addresses the provincial assessment of Ontario's forest resources using criteria and indicators as required by the *Forest Resource Assessment Policy, version 2* (2003).

The purpose of the CSFA is to provide for the sustainability (defined as long-term Crown forest health) of Crown forests and in accordance with that objective, to manage Crown forests to meet social,

economic, and environmental needs of present and future generations.

Sustainable forest management requires that today's decisions involve a balance between social, economic, and environmental factors. This is a challenging responsibility. A proper balance will not foreclose on the options of future generations and will not attach a debt burden on future options. The *State of the Forest Report* should be a barometer of success in the achievement of sustainable forest management; however, it is recognized that there may be differences in interpretation. Reporting on forest sustainability is relatively new and it is recognized that there will continue to be improvement.

introduction.

Old Growth Policy and Definitions

The development of the Old Growth Policy and Definitions is one example of how the legislative and policy framework has evolved over the period of this report. Many other examples are presented in Criterion 7.

The details of Ontario's plan for the conservation of old forests are set out in the document Old Growth Policy for Ontario's Crown Forests (2003¹). This policy directs that old growth conditions and values will be identified and present on Crown forest lands now and in the future. The policy replaces A Conservation Strategy for Old Growth Red and White Pine which was implemented in 1995. The old growth policy is supported by Old Growth Forest Definitions for Ontario (2003).

¹ <http://ontariosforests.mnr.gov.on.ca/publications.cfm>

Chapter 1 of the *State of the Forest Report* contains background information necessary for an understanding of the various influences on the practice of sustainable forest management in Ontario. The chapter covers Ontario's legislation and policies which contribute to sustainable forest management, as well as the national and international context.

Ontario has developed a flexible, adaptive and comprehensive system of legislation, regulations, policies and technical guides for forest management, within a legal and policy context that promotes public consultation and sustainable resource management. Development of the legislative and policy framework has involved extensive public consultation and comment, as well as the forging of partnerships with forest stakeholders to facilitate the design and implementation of a fair and functional legislative and policy framework for Ontario's forests.

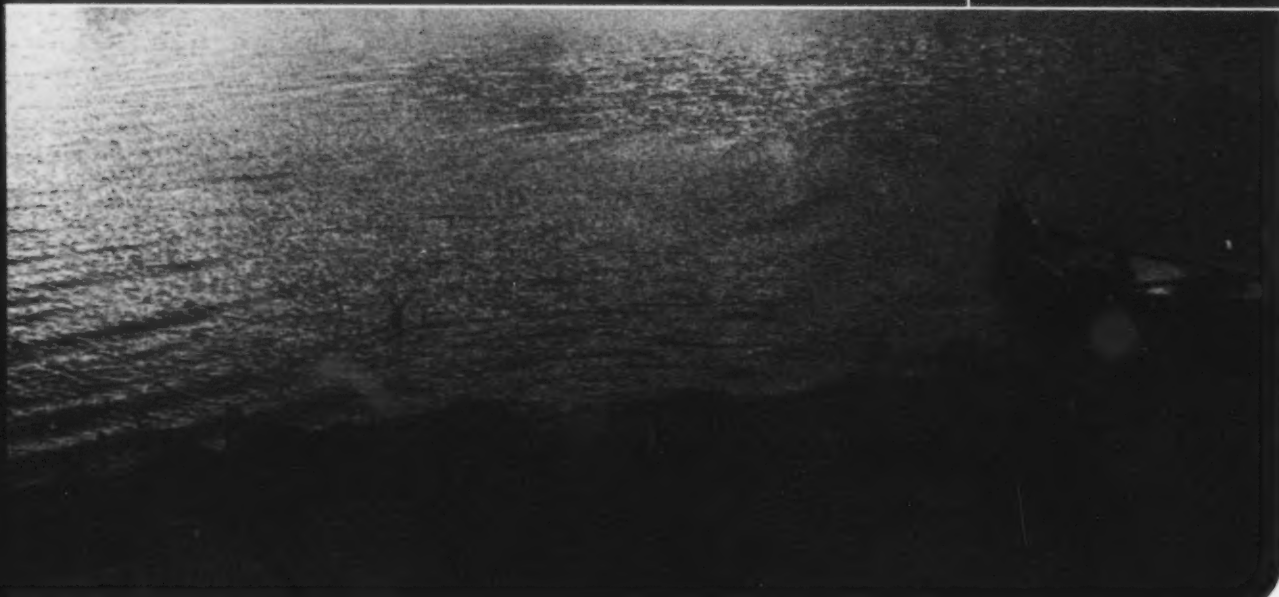
The overall strategic context for forest management in Ontario is defined by the *Policy Framework for Sustainable Forests* (1994). The framework sets broad direction for forest policy, and makes forest sustainability the primary objective of forest management programs.

The CFSA is the key piece of forestry legislation in Ontario. It provides for the regulation of forest planning, information, operations, licensing, trust funds, processing facilities, remedies and enforcement, and transitional provisions. It specifies four manuals to guide various aspects of forest management in Ontario.

Forest management in Ontario is also subject to environmental assessment, which is a legislated decision making process used to promote sound environmental planning. In Ontario, it is defined and mandated through the *Environmental Assessment Act*. The Ministry's management of Crown forests in the Area of the Undertaking is bound by the conditions of the EA Approval.

National and international developments have established the context for Sustainable Forest Management. A series of United Nations conferences and commissions in the early 1990s defined sustainable forest management. It was agreed that a set of internationally accepted Criteria and Indicators (C&I) for Sustainable Forest Management (SFM) would be developed. The Montreal Process established a working group for non-European boreal and temperate forests. The Montreal Process initiative issued the

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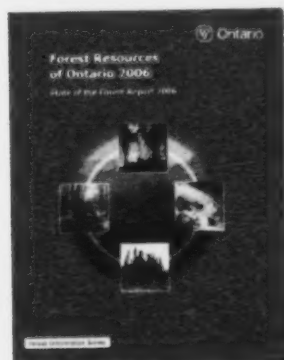
Santiago Declaration, which endorsed a set of seven national criteria and associated indicators for reporting on progress toward the "conservation and sustainable management of temperate and boreal forests".

The Canadian Council of Forest Ministers (CCFM) developed a national framework of C&I for sustainable forest management in 1995 based on the Montreal Process C&I. After initial national reporting on the C&I, the CCFM endorsed the establishment of the National Forest Inventory program to improve the consistency in data and inventories between provinces. Ontario is a partner in the National Forest Inventory.

Canada has maintained a National Forest Strategy since the 1980s. Canada's current National Forest Strategy *A Sustainable Forest: The Canadian Commitment, the National Forest Strategy for 2003 to 2008* is sponsored by a coalition of both government and non-government organizations. Ontario is an active member of the National Forest Strategy Coalition and its steering committee.

In Canada, provincial governments have constitutional responsibility for forest management on more than 70% of the forest land base. Many provincial governments have introduced legislation, enforcement measures and reporting mechanisms to ensure the sustainability of forests.

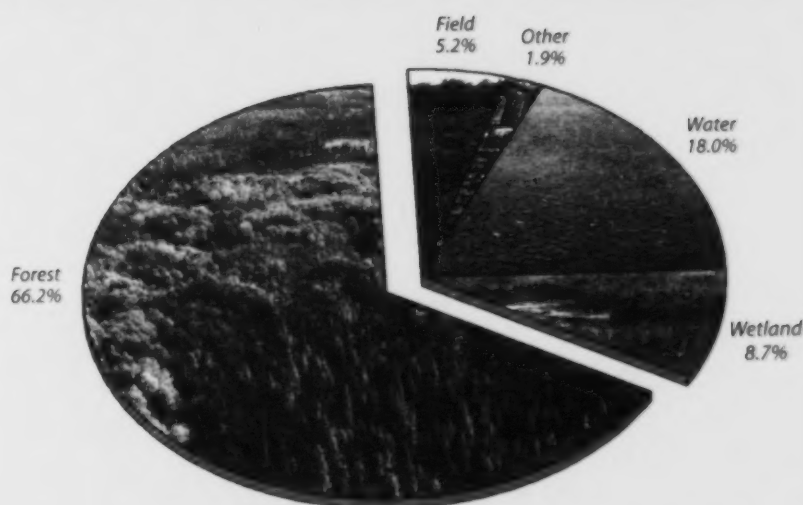
ontario's forests.



Chapter 2 contains a summary of a related report called the *Forest Resources of Ontario* (FRO), which characterizes Ontario's geography, climate, and forest. This report continues the practice of reporting forest statistics which began in the 1920s. The FRO is published at five year intervals and includes forest summaries by ownership type, forest type, and age class for forest regions, ecological regions, administrative regions, historical comparisons and landscape patterns. Many indicators in the *State of the Forest Report* depend on this detailed information.

Forest management generally occurs in a broad band in the central portion of the province, where the majority of the land is owned by the Crown. Forest management on these Crown lands is carried out under the EA Approval. These lands are collectively referred to as the Area of the Undertaking (AOU). To facilitate forest management in the AOU, the land has been administratively divided into forest management units. North of the AOU, forest management is not approved as an activity, access is limited but some fire suppression does occur. Most of the land south of the AOU is privately owned. The

Summary of the per cent of Land and Water in Ontario



The FRO is published at five year intervals and includes forest summaries by ownership type, forest type, and age class for forest regions, ecological regions, administrative regions, historical comparisons and landscape patterns.



province provides a framework for the protection of natural resources on private lands through the provisions of the Conservation Land Act, the Municipal Act, the Planning Act and the Forestry Act.

The Forest Resources Inventory (FRI) is a series of detailed forest information and maps, compiled on an ongoing basis by the Ministry. The FRI attributes described include a classification of forest cover and, if available, forest ecosystem classification information. Satellite data has been used to fill data gaps in both FRO and the *State of the Forest Report*.

Provincial Administrative Zone Statistics:

- 40.7% of Ontario falls within the Area of the Undertaking (AOU – see definition in glossary) where commercial forestry takes place (43.8 million ha) which is 83.3% forest and 79.4% productive forest
- 45.8% of Ontario falls in the Northern Boreal, which is 68.9% forest and 41.6% productive forest
- 8.2% of Ontario falls within Southern Ontario which is 28.8% forest
- 91% of all people in Ontario live in Southern Ontario
- 42.1% of Ontario falls within the Planning Area, defined as the AOU and the five large parks on its boundary
- 12.4% of the Planning Area is within parks and proposed protected areas



evaluating sustainable forest management.

Chapter 3 contains a discussion of sustainable forest management (SFM) assessment and evaluation. It outlines Ontario's SFM evaluation framework of criteria, elements and indicators, and the approaches used to evaluate and report on SFM.

Assessment and reporting requirements of the Forest Resource Assessment Policy are also addressed through:

- the *State of the Forest Report*, Criterion 2 and Elements 1.1, 1.2, 5.1, 5.3, 6.2 (State of the Forest Report CD);
- the summary for the EA Decision Appendix 22, section 4.1.c, p. 4-25 (State of the Forest Report, 2001);
- the forest resource assessment project 2001 (State of the Forest Report CD);
- the *Forest Resources of Ontario 2006* (State of the Forest Report CD);
- *Ontario's Forest Industry Facility (Mill) Statistics* (State of the Forest Report CD); and,
- the *Provincial Wood Supply Strategy* (State of the Forest Report CD).

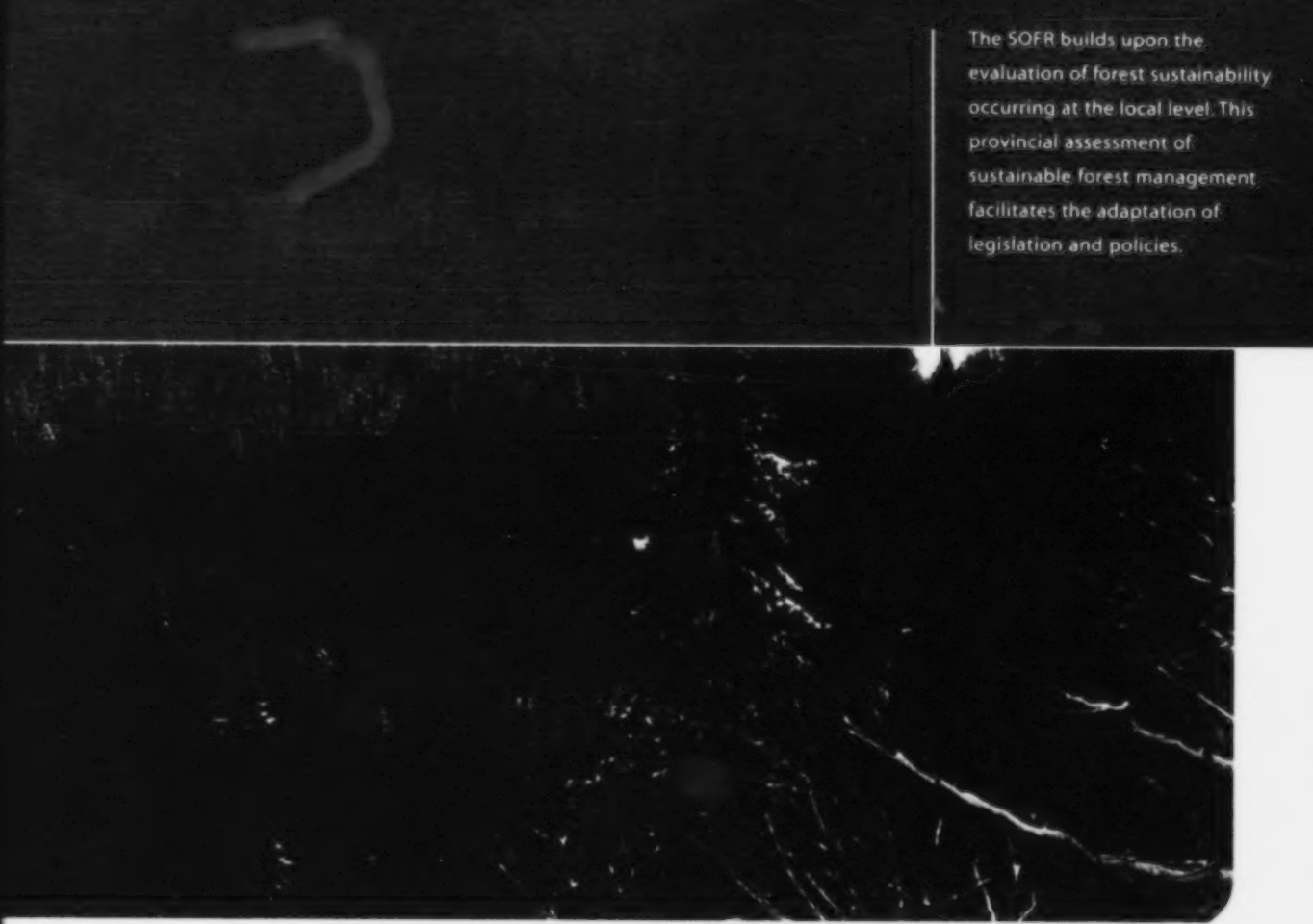
Ontario has developed a framework of C&I for sustainable forest management based on the Montreal Process and national C&I that includes seven criteria, expressed as provincial forest sustainability goals. The criteria are designed to reflect the public's priorities for sustainable forest

management. These criteria are then further subdivided into elements; within elements, indicators are used to present a more specific description of the state or condition that must be met to achieve the established goal. Each indicator is a measurement tool used to assess progress toward the achievement of overall sustainable forest management goals and objectives.

The title of each element conveys a specific objective for the indicator group. For example, the title of Element 1.1 conveys that all of the indicators in this group contribute towards the conservation of ecosystem diversity. Similarly, each criterion contains a group of elements and associated indicators. The title of a criterion conveys a broad objective that all of the indicators and elements within the grouping contribute towards.

Ontario uses several mechanisms to demonstrate sustainable forest management:

- there is a requirement for each forest management plan to assess progress towards sustainable forest management at three stages: development, implementation and completion;
- independent forest audits are completed every five years on each management unit by third party auditors who assess



The SOFR builds upon the evaluation of forest sustainability occurring at the local level. This provincial assessment of sustainable forest management facilitates the adaptation of legislation and policies.

the compliance and effectiveness of forest management in meeting legislative and policy requirements and assess whether the forest management plan and its implementation are providing for the sustainability of the forest;

- in 2004, the Minister of Natural Resources announced his intention to require third party forest certification on all sustainable forest licences. Forest certification, which independently assesses sustainability against set standards, is an important factor in the forest products marketplace;
- the SOFR complements and builds upon the evaluation of forest sustainability occurring at the scale of Ontario's forest management units. This provincial

assessment of sustainable forest management facilitates the adaptation of legislation and policies.

Ontario's sustainability evaluation framework represents current knowledge regarding how forest ecosystems, economies, and communities function, within the limitations of the Ministry's ability to measure specific components. Indicators may change over time, as knowledge advances and the ability to monitor and measure improves. The criteria and indicators evaluation framework was updated prior to producing SOFR 2006. The following table illustrates the changes to the Criteria and Indicator Framework for Ontario.

evaluating sustainable forest management

Table 1 Criteria and Indicator Framework for Ontario

	Ecological				Socioeconomic		Policy & Structure
Criterion #	1	2	3	4	5	6	7
Criterion Name	Biodiversity	Forest Productivity and Resilience	Soil and Water Resources	Global Ecological Cycles	Economic and Social Benefits	Social Responsibilities	Sustainable Forest Management Framework
Elements	▼ 4 > 3 landscape/ecosystem diversity combined	▲ 2 > 3 added forest productivity	2 > 2 Unchanged	▲ 2 > 4 added nutrient cycles & water balance	4 > 4 Unchanged	3 > 3 Unchanged	5 > 5 Unchanged
Indicators	▼ 12 > 10 reorganized, added invasive species and genetic health	9 > 9 reorganized	▲ 4 > 5 added roads & water crossings	▲ 5 > 8 added nutrient cycling, evapotranspiration & land conversions	15 > 15 minor changes	▼ 9 > 6 community resilience assessed using 1 indicator with multiple measures; timing is too soon to repeat a public survey	▲ 11 > 14 reorganized between elements to group monitoring related indicators; added technology transfer

evaluating sustainable forest management

continued

Table 1 Criteria and Indicator Framework for Ontario

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Criterion Name	Biodiversity	Forest Productivity and Resilience	Soil and Water Resources	Global Ecological Cycles	Economic and Social Benefits	Social Responsibilities	Sustainable Forest Management Framework
Elements	▼ 4 > 3 landscape/ ecosystem diversity combined	▲ 2 > 3 added forest productivity	2 > 2 Unchanged	▲ 2 > 4 added nutrient cycles & water balance	4 > 4 Unchanged	3 > 3 Unchanged	5 > 5 Unchanged
Indicators	▼ 12 > 10 reorganized, added invasive species and genetic health	9 > 9 reorganized	▲ 4 > 5 added roads & water crossings	▲ 5 > 8 added nutrient cycling, evapotranspiration & land conversions	15 > 15 minor changes	▼ 9 > 6 community resilience assessed using 1 indicator with multiple measures; timing is too soon to repeat a public survey	▲ 11 > 14 reorganized between elements to group monitoring related indicators; added technology transfer

Changes are illustrated using arrows. An increase in the number of elements or indicators is illustrated using the up arrow, while a decrease is depicted using the down arrow. The numbers compare the Elements and Indicators used in the 2001 versus the 2006 report.

The *State of the Forest Report* uses three basic types of information: environmental, social, and economic. Environmental information is usually based on resource inventory surveys or research data. Most socioeconomic information is derived from census data and surveys of particular target groups (e.g. forest industry or public opinion).

Indicators in the *State of the Forest Report* may contain both quantitative and qualitative data. In this report the Ministry has continued to use a qualitative evaluation approach for the assessment of forest sustainability. However, the Ministry has also continued to monitor the development of quantitative methodologies to determine if they may offer more objective evaluation methods in the future. At this time the Ministry has continued to rely on a qualitative approach because many indicators only have qualitative data, and targets have not been established for most indicators.



This *State of the Forest Report* complements the discussion of indicators and forest sustainability issues with a graphic system of condition ratings similar to those used in the B.C. report entitled *The State of British Columbia's Forests - 2004*. Ministry staff familiar with the information rated the condition of indicator state, trend, and data. Readers should review the ratings in conjunction with the detailed text to understand the findings and also be cautious about generalizing this information at a higher level than the indicator itself, which would require appropriate weighting of the information.

Ontario's *State of the Forest Report* is strengthened through the use of subject matter experts who have played an important role in all stages of the report's development. Their expertise was required for the design of a resource condition monitoring program, for robust data analysis and interpretation, in defining good indicators of sustainable forest management, and in evaluating performance.

Criteria and Indicators Rating System

Subject experts have played an important role in all stages of this *State of the Forest Report*. Their expertise is required for the design of a resource condition monitoring program, for robust data analysis and interpretation, in defining good indicators of SFM, and in evaluating performance. For each indicator, Ministry staff (experts) familiar with the information rated the state, trend, and adequacy of information, as follows:

- the state – whether conditions identified by the indicator suggest good, mixed or fair, or poor progress towards SFM;
- the trend – whether those conditions are improving, mixed or showing no change, or deteriorating; and
- the adequacy of data – whether the data (information) available for the indicator is adequate, partial, or inadequate.

An "unknown" rating was also available for all categories. It is acknowledged that this approach is subjective in nature and that the ratings represent the opinion of a single expert. Further, some indicators are comprised of multiple measures (such as indicator 1.2.2), in these cases assigning a single rating for a multitude of measures poses significant challenges.

The scope of indicators of SFM described in this report is very broad. Multiple government agencies and forest management companies influence the indicators, but no single organization is wholly accountable for the states and trends illustrated by the evaluation symbols. The evaluation presented is an opinion based upon the available information and experience of the Ministry staff involved. The reader is invited to examine the information and formulate their own opinions.

State	
Symbol	Meaning
	Good
	Mixed or Fair Progress
	Poor
	Unknown
Trend	
Symbol	Meaning
	Improving
	Mixed or No Change
	Deteriorating
	Unknown
Data	
Symbol	Meaning
	Adequate
	Partial
	Inadequate
	Unknown

criteria and indicators.

An overview of the Indicators of Forest Sustainability

Criterion 1: Conserving Biological Diversity

- 1.1 Conserving Ecosystem Diversity (4 indicators)*
- 1.2 Conserving Species Diversity (3 indicators)*
- 1.3 Conserving Genetic Diversity (3 indicators)*

Criterion 2: Monitoring and Maintaining Forest Productivity and Resilience

- 2.1 Monitoring and Modeling Forest Productivity (2 indicators)*
- 2.2 Monitoring and Managing Incidences of Forest Disturbance (4 indicators)*
- 2.3 Maintaining and Conserving Forest Ecosystem Resilience (3 indicators)*

Criterion 3: Protecting and Conserving Ontario's Forest Soil and Water Resources

- 3.1 Minimizing Effects of Forest Management Practices on Forest Soil Resources (1 indicator)*
- 3.2 Minimizing Effects of Forest Management Practices on Water Resources (4 indicators)*

Criterion 4: Monitoring Forest Contributions to Global Ecological Cycles

- 4.1 Managing Ontario's Forest Sector Contributions to Global Carbon Enrichment (3 indicators)*
- 4.2 Managing Conversion of Forest Land to Other Uses (2 indicators)*
- 4.3 Monitoring Nutrient Cycles in Ontario's Forests (2 indicators)*
- 4.4 Monitoring the Water Balance in Ontario's Forests (1 indicator)*

Criterion 5: Providing for a Continuous and Predictable Flow of Economic and Social Benefits from Ontario's Forests

- 5.1 Maintaining or Enhancing the Resource Productive Capacity of Ontario's Forests (4 indicators)*
- 5.2 Monitoring and Supporting Forest Sector Employment, Investment, and Competitiveness (4 indicators)*
- 5.3 Monitoring and Supporting Value-Added Products and Services (4 indicators)*
- 5.4 Maintaining or Enhancing Recreation, Tourism, and Other Social and Environmental Values Associated with the Forest (3 indicators)*

Criterion 6: Accepting Ontario's Social Responsibilities for Sustainable Forest Development

- 6.1 Respecting Aboriginal Rights and Supporting Aboriginal Participation in Sustainable Forest Management Activities (3 indicators)*
- 6.2 Forest Community Well-Being and Resilience (1 indicator)*
- 6.3 Maintaining Effective Public Participation In Sustainable Forest Management Decision-Making (2 indicators)*

Criterion 7: Maintaining and Enhancing Ontario's Framework for Sustainable Forest Management

- 7.1 Maintaining and Enhancing Ontario's Legal Framework for Sustainable Forest Management (1 indicator)*
- 7.2 Maintaining and Enhancing Ontario's Institutional Framework for Sustainable Forest Management (4 indicators)*
- 7.3 Maintaining and Enhancing Ontario's Economic Framework (economic policies and measures) for Sustainable Forest Management (2 indicators)*
- 7.4 Maintaining and Enhancing Ontario's Monitoring Framework (5 indicators)*
- 7.5 Maintaining and Enhancing Ontario's Research and Development Framework (capacity to conduct and apply research and development) for Sustainable Forest Management (2 indicators)*

Chapter 4 presents the

indicator information necessary for the evaluation of sustainable forest management.

The hierarchy (C&I framework) of criterion, element, and indicators was used to organize Chapter 4. This chapter contains over 200 pages of detailed information related to the 67 indicators of sustainable forest management used in this report. Each of the indicators examines specific detail about a subject area, and presents an evaluation of progress towards the achievement of sustainability at that level. The aggregate performance in all areas is then used, in Chapter 5, to develop an overall conclusion about the sustainability of Ontario's forests.

This chapter contains over 200 pages of detailed information related to the 67 indicators of sustainable forest management used in this report.



The State of the Forest Report, 2006 (SOFR) is a lengthy document. The attached CD contains the full text of the document. The same information can be downloaded from the MNR website www.mnr.gov.on.ca.

discussion of key findings.

Chapter 5 contains a discussion of the key findings from each criterion, focusing on areas where there are opportunities to continuously improve sustainable forest management in Ontario. This chapter finds that some aspects of sustainable forest management in Ontario are positive, while other aspects exhibit room for improvement. Improvement in data availability and quality would positively impact the ability to evaluate the sustainability of forest management and identify policy adjustment opportunities. Ontario has been blessed with an abundance of natural resources. This natural capital helps to drive the economy, contributes to a healthy environment and offers numerous opportunities for tourism and recreation. The Minister articulated Ontario's **vision** for its natural resources, in *Our Sustainable Future*:

"Our vision for Ontario's natural resources entails safeguarding the many vital contributions that they make to our lives. As a Ministry, we are working to promote healthy, sustainable ecosystems and the resource economies and communities that depend on them. We will work to conserve biodiversity, protect greenspace, protect source water, ensure sustainable forestry, support renewable energy and enhance opportunities for outdoor recreation."

Ontario's legislative and policy framework has been designed to provide for the sustainability of its forests. Ontario has developed a framework of C&I to allow the province to assess and report on forest sustainability. The indicators being measured are not necessarily compatible with a five-year reporting cycle. Certain indicators are suited to a longer reporting period, e.g. changes in forest species composition, while others are more appropriately measured on a much shorter timeframe, e.g. delivered wood costs and value of the Canadian dollar. Inclusion of these latter two short term measures would improve the current suite of economic indicators and could allow timely policy adaptation. The very nature of this report may change in the future as science and information advances and our ability to monitor and measure specific attributes improves.



This chapter finds that some aspects of sustainable forest management in Ontario are positive, while other aspects exhibit room for improvement.

The **conservation of biological diversity** in Ontario's forests is examined using some of the most data-intensive indicators presented in this report. Gathering, compiling and analyzing inventory information is a technically challenging and expensive undertaking. Ontario's forest inventory has provided reliable forest level information for many years; however demands for detailed and accurate stand level information are increasing. An improved forest inventory would improve our understanding of the forest and facilitate the sustainable management of the forest. In 2005, the Ministry announced a significant program directed towards the enhancement of Ontario's Forest Resource Inventory. As this program is implemented

with more statistically based sampling, an improved ability to detect and report on change in future *State of the Forest Reports* is anticipated. Opportunities also exist, within the limitations of available financial resources, to enhance other related provincial inventory programs.

The information presented regarding the conservation of ecosystem diversity demonstrates that on the whole Ontario's ecosystems are resilient. The size of Ontario's forests and the relative proportion of tree species remains relatively the same as that shown in the *State of the Forest Report, 2001* (SOFR 2001). One area of concern is noted in relation to the limited existence of hemlock and yellow birch ecosystems which

discussion of key findings. continued

following harvest or natural disturbance are not being replaced with young stands of similar composition. Historically fire played a key role in the perpetuation of these ecosystems. There were improvements to the conservation of biodiversity with increases in the representation of ecological features within parks and protected areas, as well as a general increase in the amount of old growth. The existence of abundant mature forests which will

provide a supply of future old growth stands is also notable. The forest landscape pattern is shifting over time, with a gradual increase in the number of disturbance patches, which tend to be smaller than those created historically by natural means. The proportion of the managed Crown forest with access corridors has increased slightly. This is expected as new roads continue to be constructed in previously un-accessed areas of the province. Guidelines will continue to be enforced and will be updated regularly to help to ensure

that forest access roads are planned, constructed, and maintained using the best available methods, to minimize and mitigate their effects on biodiversity, wildlife habitat, and protected area values.

The effects of forest management activities on species diversity are assessed by monitoring changes in populations, which may provide an early warning of changes in ecosystem integrity, or the beginning of long-term changes in population size or distribution. Ontario's forest management guides were designed to address specific goals for maintaining habitat to support healthy wildlife populations. The success of these guidelines is determined in part by monitoring wildlife populations. Ontario has implemented monitoring programs for several groups of wildlife species, including provincially featured species, such as marten and pileated woodpecker. Ontario is also involved in the collection of data for other wildlife species including forest birds, salamanders and small mammals. Data necessary to understand natural wildlife population variability and to assess the effects of forest management on wildlife populations must be collected over many years and therefore this data is limited. Habitat for species at risk in the AOU is managed by applying, and enforcing the application of appropriate forest management guides. Provincially, southern Ontario represents the area of most concern as it has experienced the greatest

New Technology for Closing the Protected Ecosystems Gap

A fundamental principle of ecological representation is that protected areas should conserve representative examples of the known biological diversity within ecologically defined regions. Examples of biodiversity that are not adequately represented within protected areas are known as gaps in representation.

Ontario Parks has developed an automated analytical tool, called GapTool. In early 2006 it was used to prepare a provincial picture of ecological representation, including gaps. GapTool analyses landforms, vegetation classes, ecodistricts, and protected areas. GapTool has been used to assess ecological representation for all of Ontario's 71 ecodistricts and over 600 protected areas. The minimum representation requirement is 50 ha of each landform/vegetation association within each of Ontario's 71 ecodistricts.

GapTool supports provincial reporting on representation achievement, life science inventory preparation, and land use planning initiatives that involve protected areas planning. Consideration is being given to extending GapTool to assess the representation of old growth forests and aquatic life science features.

habitat loss due to substantial human pressures resulting in a landscape that has been substantially altered for agricultural, urban and industrial development. Southern Ontario ecoregions also have the highest percentage of alien plants in Ontario, with the greatest concentration occurring along roadsides, as is also the case in northern Ontario.

The province of Ontario has the highest percentage of invasive alien vascular plants in Canada but the estimate is similar to those for neighbouring states. Provincially, species at risk and invasive alien plants are of most concern in southern Ontario and are connected with ongoing development resulting in a continuing loss of forest cover. *Ontario's Biodiversity Strategy* acknowledges the issue of alien species, and includes a plan to deal with alien species. Ontario cooperates with other agencies to address the spread of invasive species. The status of species of conservation concern, species at risk and the ecological impacts of invasive species will continue to present challenges and therefore ongoing opportunities to enhance the Ministry's efforts in monitoring and understanding in order to better identify issues that could affect the biodiversity of Ontario's forested landscapes.

The conservation of genetic diversity is considered within the provincial forest management planning system. Seed from

genetically improved seed orchards is used for forest regeneration to enhance forest productivity. Management of genetic resources is occurring within the province's seed orchards, and seed collection and processing systems and this appears to be effective. There is little evidence for concern about the risk of losing genetic diversity by using genetically improved seeds from these seed orchards. Successful artificial regeneration is dependant upon a sustainable supply of high quality seed. Analysis indicates that, although local shortages may occur, a positive seed supply situation exists in Ontario. The conservation of adaptive variation is a key element in conserving genetic diversity. Adherence to Ontario's seed zone policy assists in the achievement of this objective. Cone collections that are planned well in advance will avoid problems with any localized shortages and allow collectors to take advantage of bumper crops in which the quality of cones and seeds may be better. An opportunity exists to adjust policy to promote more long-term planning for seed collection and use. Populations of species near the margins of their range may be uniquely adapted and thus present a future opportunity to expand their operable range especially as climate change impacts species distribution. Consideration of these species during harvest and renewal operations presents a future opportunity to enhance the management of forest genetics in Ontario.

Forest productivity and resilience

examines forest growing stock indices and net primary productivity techniques, the results of forest disturbance monitoring, and evaluates the ability of the forest to respond to disturbance and to renew itself. Most indicators in this criterion exhibit generally satisfactory or positive results, however, there are three areas of concern, one in each element.

The first area of concern is related to limitations in the data available to measure change in forest productivity. Forest productivity is a measure of the rate at which biomass is accumulated, and represents the capacity of the land to sustain a continuous flow of goods and services. The forest productivity related indicators do not reveal any issues. However, the current data does have limitations because Ontario's Forest Resources Inventory was designed to provide point in time data on a 20 year cycle for broad scale, strategic planning. It was not designed to detect subtle changes in the forest over time. Ontario's ability to model this information is improving with the use of more detailed provincial data (including, an enhanced forest resources inventory, growth and yield curves and natural disturbance cycles), that more accurately represents the condition of Ontario's forests.

discussion of key findings.

continued

Furthermore, in 2005, the Ministry announced a significant program directed towards the enhancement of Ontario's Forest Resource Inventory. As this program is implemented, an improved ability to detect and report on change in future *State of the Forest Reports* is anticipated.

By monitoring and managing incidences of forest disturbances, this element examines disturbances caused by fire, weather, insects and disease, invasive species and humans. During the past five years disturbances caused by fire, damaging weather, insects and disease, and humans have remained within the bounds of normal variation. As long as this trend continues, and the natural ability of the forest to recover is not diminished, the risk to SFM in Ontario from these factors remains low.

The introduction of invasive alien insects and diseases to Ontario, represents the second area of concern. The introduction of invasive insects and diseases has grown in recent years with increasing global trade and is beyond the direct control of forest management.

Continued vigilance and ongoing monitoring and control efforts are necessary to minimize the risk posed by the introduction of these species. Invasive alien species, such as emerald ash borer, may enter the province through urban areas in southern Ontario but once established may pose a serious risk to forests throughout the province.

Maintaining and conserving forest ecosystem resilience is examined using forest regeneration, downed woody debris and logging damage indicators.

Downed woody debris (DWD) provides important habitat for forest-dwelling organisms. The Growth and Yield Program is monitoring trends in DWD, while research is examining the effects of forest management activities on the supply of DWD and the associated response of DWD-dependent species. This research is relatively new and over the long term will be used to revise management guides.

Many of Ontario's forest types are managed with partial harvesting systems that leave a large number of trees standing, as future crop trees, for regeneration, or for wildlife

purposes. Minimizing damage to residual trees and regeneration can therefore be a critical factor in achieving SFM objectives. Forest Compliance program inspections indicate that forest operations are generally acceptable, and results have been improving since 1999. Initial 5-year results from a long term logging damage study indicate that on average operations met the 85% damage free standard, but damage to saplings is highly variable and will be assessed in future monitoring efforts.

The third and final area of concern in this criterion revolves around data i.e., the lack of appropriate, statistically-valid data to monitor forest renewal for evaluating the



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long-term sustainability of forest management practices. During the reporting period the area that was renewed approximated the area that was harvested. However, since there are areas depleted via natural means as well, there may or may not be a shortfall in the area being treated for renewal. Following natural disturbance or harvesting of a forest stand, the area is recorded as depleted until a prescribed renewal treatment occurs, a regeneration assessment is conducted and the area is determined to be free-to-grow (FTG). Free-to-grow surveys determine whether the area is once again capable of contributing to the productive forest land base. Unfortunately a gap continues to exist between those areas eligible for survey and those that are actually surveyed. In order to monitor trends over the longer time frames appropriate to forest management, appropriate data on forest productivity and forest renewal are essential. The ability to monitor and report on long-term forest sustainability would improve through the use of better data and tools.

The **protection and conservation of forest soil and water resources** is addressed by applying a comprehensive approach, which includes research and development to support management practices and standards; application of up-to-date guides; a competent well-trained work force; industry compliance inspections; Ministry compliance verification; guide

effectiveness monitoring and independent forest audits to ensure the overall management approach is complete and appropriately implemented. All of the data for the indicators in this criterion are indirect and most are derived from the provincial Forest Operations Information Program (i.e., compliance data). The results are generally positive, with low risk to forest sustainability identified in this area. There are also continuing efforts to improve guides, monitoring, training and research, in ongoing work aimed at monitoring and minimizing forest management impacts on forest soil and water resources, and in intensive long-term research to validate the indirect measures currently used. Efforts also continue to develop more rigorous sampling designs that can be effectively summarized to provide an overall provincial compliance perspective.

Monitoring forest contributions to global ecological cycles

in Ontario focuses on the carbon, nitrogen, sulphur and water cycles. Carbon budget model results depict Ontario's Crown forests and associated products as a modest carbon sink when averaged over the next 100 years. Deforestation is an increasing negative trend in southern Ontario. There are also positive trends in the forest industry's investigations into conversion to renewable biomass energy sources, and the advent of new projects designed to

convert forest biomass to biodiesel fuel. Decreasing the use of fossil fuels by the forest industry for industrial needs by increasing the use of biomass is seen as a positive trend. Information related to the forest sector's energy efficiency and the use of recycled fibre would enhance the understanding of forest sector contributions to the carbon cycle. Knowledge and understanding related to Ontario's forest sector contributions to global carbon enrichment is improving, however, there is still room for considerable improvement in this subject area.

Sulphur deposition in the form of acid rain continues to be brought under control in Ontario, but there is still a very large portion of the province subject to excess acid deposition from sulphur dioxide and oxides of nitrogen. Even these lower levels of deposition may have a negative effect in areas where the buffering capacity of the soil has been eroded over time. A tentative finding also indicates that climate change may be negatively affecting the water balance in Ontario's forests and in particular those found in the northwest or north central portions of the province. Given the prevalence of coarse, shallow soils with low water retention capacity generally found in

discussion of key findings. continued

Carbon Assessment in Boreal Wetlands

Nearly 1/3 of Ontario's land base is covered by wetlands, most of which are peatlands (wetlands with peat depth of at least 40 cm). These areas may sequester or store significant amounts of carbon, making them an important component of carbon budget calculations. A new report entitled *Carbon Assessment in Boreal Wetlands of Ontario*, published by The Ministry's Ontario Forest Research Institute (OFRI), provides modelers, policymakers and others interested in climate change with a useful review of existing information on how carbon cycles through Ontario's peatlands over various time periods and spatial scales.



"This report focuses on the interactions among peatland plants, hydrology, carbon cycling and budgets at local and regional scales in boreal Ontario," said Jim McLaughlin, a research scientist at OFRI and author of the report. "The report complements several other excellent reviews of wetland carbon cycling published over the last decade. It also presents research now underway to improve the ability to assess carbon in Ontario's peatlands and identifies critical research gaps. The information presented can be used to help define the role of Ontario's peatlands in national and global carbon cycles and budgets."

Download the PDF version from OFRI's Intranet site: <http://mnronline.mnr.gov.on.ca/spectrasites/ardb/ofri.cfm>; click on New Climate Change Publications.

the AOU, there is an expectation that forest productivity in the AOU will be sensitive to climate change.

Ontario's success in **providing a continuous and predictable flow of social and economic benefits from the forest** exhibited variable results across communities but overall relative stability for the reporting period (1999 to 2004). The social and economic indicators are occasionally subject to rapid change, and in 2005 and 2006 there were notable negative changes in the

economic and social environment. This situation presented a challenge in the preparation of the report; if the analysis was limited to the period ending in 2004, the results would be in stark contrast with the 2006 economic situation. To address this issue, data from the 1999 to 2004 period is used for reporting, while supplemental information provides context for the 2006 time period.

In order to manage the forest sustainably, resource extraction rates must not exceed the long term productive capacity of the forest. Within the land base available for

harvest, the capacity to meet the demand for forest resources in Ontario is evident. This is evidenced by the consistent historic trend of under-harvest. However, the gap between available harvest area and actual harvest is narrowing. The area available for harvest in Ontario has decreased by approximately 27% since the early 1990s due to the establishment of new parks and protected areas and the implementation of new forest management guides. Under-harvest in itself has the potential to adversely impact the achievement of broader short- and long-term management objectives. The

"Approximately 13% of forest dependent communities have a high forest dependency"

recent closures of processing capacity may compound this effect. However, the timber products industry is dynamic, and opportunities still exist for it to grow. For instance, new mills have been licensed to process underutilized tree species, and some existing mills have re-tooled or refined processing to improve production.

Ontario uses a suite of forest management guides and modeling in combination with a forest management planning process that is both strategic and operational to maintain the habitat for selected wildlife species, to protect other known values and to maintain a sustainable forest resource. Generally, it appears that the harvest of economically and socially important species is sustainable, but population data is not available for all of these species, and therefore, there is a degree of uncertainty with respect to the sustainability of the harvest of individual species.

During 1999 to 2003, Ontario's forest industry profit trends were generally positive and quite favourable compared to the national forest industry. Ontario's forest-based industries are a sizable source of employment, particularly in northern

Ontario, providing an above-average share of full-time jobs, with above-average wages. While capital investment was healthy in Ontario during the 1999 to 2003 period, it appears that investment in research and development was low. Overall, the situation in Ontario during the reporting period was positive relative to the forest sector in the rest of Canada. However, the subsequent crisis in the forest products sector resulted in numerous mill closures and employment losses throughout northern Ontario. The Ontario government has been responding by developing various initiatives to improve the health of the sector.

Ontario's forest-based natural capital provides many different goods and services enjoyed by society. Some of these goods are traditional products or represent new or emerging markets, and others are somewhat intangible and not recognized by a market economy. Value-added timber and non-timber forest products and services represent an area of opportunity for Ontario enabling the generation of additional jobs and income from the same forest landbase. The significance of these non-timber forest-based goods and services, both market and non-market, is difficult to assess because many of the activities are not monitored or valued by a market economy.

This report examines **Ontario's acceptance of its social responsibilities for sustainable forest development** by focusing on three key areas: support for Aboriginal participation in SFM, forest community well being and resilience, and public participation in SFM decision making.

- Aboriginal participation in the forest management planning process and in forest-based economic opportunities increased during the reporting period. Initiatives currently underway are enhancing the capacity of Aboriginal peoples to participate in various forest-based opportunities or processes. The Ministry is continuing to work with third parties, Aboriginal communities and treaty organizations to explore new approaches. Through shared knowledge and respect for Aboriginal values, the Ministry and Aboriginal communities will continue to foster informed and effective decision-making during the preparation and implementation of forest management plans.
- Approximately thirteen per cent of forest dependent communities have a high forest dependency, coupled with a relatively low social and economic diversity and can be categorized as 'communities of concern'. Expansion of social and economic diversity in forest-based communities is considered desirable, as diversified communities are expected to more successfully respond

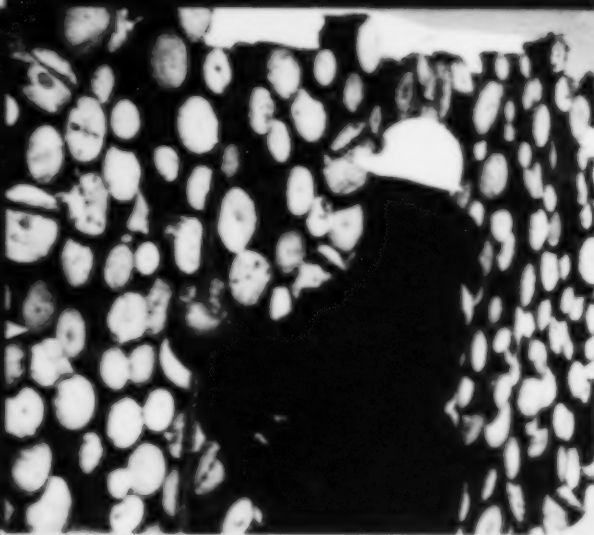
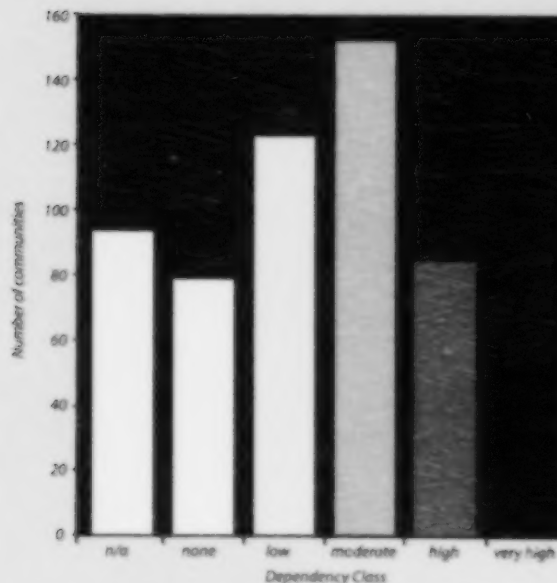
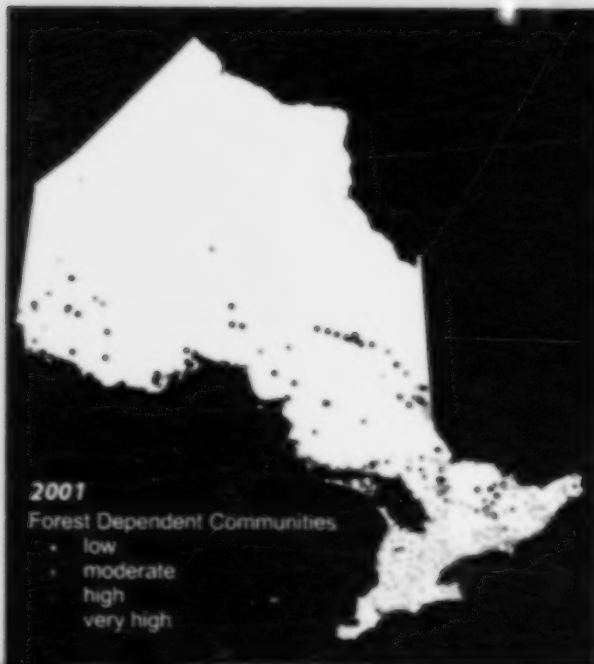
discussion of key findings. continued

Forest-Dependent Communities

Forest Dependency is the relative importance of the forest industry to the local economy indexed to the province as a whole. It is calculated as the percentage of the local labour force employed by forest industry divided by the percentage of provincial labour force employed by forest industry.

$$\frac{\% \text{ employed in the Forest Industry in the local labour force}}{\% \text{ employed in the Forest Industry in the provincial labour force}}$$

The number of forest-dependent communities in Ontario is increasing. Four hundred twelve (70%) communities were dependent upon forestry in 2001 compared to 409 (70%) in 1996 and 394 (67%) in 1991.



and adapt to changing social and/or economic conditions. The reasons for the lack of diversity in many communities are both systemic and historic; however, the related public policy questions and the implementation of solutions go well beyond the Ministry's resource management mandate.

- Current public participation processes used in forest management decision-making appear to provide fair and effective opportunities for public participation. A survey of Ontario-based local citizens committee members also indicated that most agree that the forest management planning process outcomes are fair and are generally satisfied with the overall process itself.

The Ministry's effectiveness in **maintaining its sustainable forest management framework** is also examined in this report. This is assessed by examining the Ministry's effectiveness in establishing and maintaining: legislation and policy; infrastructure; an economic framework; monitoring programs; and research and development. Many trends in this criterion are positive. The Ministry has maintained and enhanced an effective legislative, policy and institutional framework over the five-year assessment period. The Ministry and its forest industry partners are implementing a strategy to ensure the

maintenance of a competent workforce. A good network of forest access roads is in place, which is subject to greater controls than in the past, in order to strike a balance between the need for resource access, while minimizing the adverse impacts on other resources. The Forest Operations Information Program (i.e., the compliance program) is functioning well showing a general improvement in the compliance rate, and a reduction in the significance of non-compliant activities. Ontario has also maintained a continuous five-year cycle of independent forest audits and results from these audits indicate that the majority of licensees are complying with their SFM responsibilities.

There were some information gaps noted in this criterion. Crown stumpage charges have generally been consistent with the availability of the resource, but additional information and analysis is required to determine whether the return to the public is fair, a competitive investment climate exists, or the resource is being used efficiently.

Areas of concern were also found in this criterion. Ontario's public policy review and consultation infrastructure is well-established; however, some effectiveness challenges remain. For example there is difficulty obtaining representation from Aboriginal communities on local citizens

committees. This report also examined the implementation of twelve inventory and monitoring programs addressing topics as diverse as forest inventories, guideline effectiveness and socio-economics. The Ministry has established and implemented all of its legally mandated inventory and monitoring programs, and in some cases programs provide additional information that enhances overall monitoring program delivery. Two inventory programs, those dealing with wildlife assessment and growth and yield, did not meet their program targets. Under-achievement in inventory and monitoring programs has the potential to gradually erode overall program effectiveness, and the ability of the Ministry to effectively report on SFM. In addition, the Ministry's funding of forest-based research and development has declined significantly over the five-year period. Researchers in Ontario have become more collaborative in recent years. This has resulted in an increased level of investment by research partners, which may have offset some of the declines in government funding; however, the specific contribution of partners has not been tracked through time and therefore the overall effect is unclear.

current and pending challenges.

In delivering on its sustainable forest mandate Ontario faces numerous current and pending challenges. Some of these challenges fall within the mandate of the Ministry and they can be addressed through the Ministry's adaptive management approach. However, many challenges, such as global environmental issues, are driven by factors outside of the Ministry's control.



Global environmental issues are affecting Ontario's forests. Science has demonstrated that the earth's climate has become warmer and that this warming trend has accelerated in recent decades. Airborne pollutants, including acid rain and smog are regional issues and the sources of these pollutants may travel great distances. For example 50% of Ontario's smog is derived from sources south of the border. (Chapter 4, Criterion 4). Ontario's opportunities to address these challenges will involve working at national and international scales to influence positive change.

Environmental non-government organizations (ENGO) are focused on four areas of concern:

- **Forest management:** At the Earth Summit (1992), forest management issues were at the forefront of discussion. There were two significant developments that had their origins in the Summit, the first, was the use of C&I to assess forest management practices, and the second was third party evaluation of forest management through forest certification. Recently ENGOs have expressed a growing interest in the recognition of Aboriginal rights and traditional knowledge and high conservation value forests. Ontario

has made significant progress in developing its SFM legislative and policy framework. The implementation of this framework readily satisfies the requirements of current independent forest certification standards (Chapter 4, Criterion 7).

- **Endangered forests:** Canada's boreal forests, and particularly the portion that is not presently subject to resource development, are considered by some as endangered forests based on their belief that wilderness and other values would be changed by resource use. Ontario has increased its proportion of protected Crown forests and is working with willing First Nations to improve social and economic conditions while respecting traditional values (Chapter 4, Criterion 1 and 6).
- **Animal welfare:** Anti-trapping ENGO campaigns of the past continue to result in a depressed fur market. Ontario has made every effort to adopt humane trapping standards and promote fur as a sustainable natural resource (Chapter 4, Criterion 5).
- **Species at risk:** Within the Crown forest in Ontario the threatened woodland caribou population has been a focus. Ontario continues to take action to conserve, protect and recover threatened woodland caribou habitat (Chapter 4, Criterion 1).



Ontario has a SFM legislative and policy framework, comprised of components which are reviewed on a five-year cycle. The public and interested parties are afforded the opportunity to influence the policies that they are concerned about (Chapter 4, Criteria 6 and 7).

The increasing globalization of the world's economy is challenging Ontario's ability to compete in commodity-based forest products markets (Chapter 4, Criterion 5).

■ **Cost of production:** Ontario has become a high cost forest products producer relative to other jurisdictions in North America due to high electrical energy rates, a rapid appreciation of the

Canadian dollar and high delivered wood costs. Energy costs are expected to continue to rise. Ontario has deregulated its electrical energy markets, while most other jurisdictions have not. Northern Ontario's aging infrastructure will exacerbate these problems.

■ **International competition:** At the same time offshore capacity is growing, competition from offshore producers is increasing and the real price of forest products is declining. Political stabilization in some countries that can produce timber fibre faster than Ontario has created forest product business opportunities with inherently lower costs of production.

These offshore producers also tend to have a younger workforce that works at much lower wage rates than Canadian workers. Producers who may not necessarily have a large internal supply of fibre, but substantially lower wage rates, high returns on capital and new state of the art facilities will provide stiff competition for Canadian products. Canada's relatively low returns on capital versus that available elsewhere in the world make access to highly mobile world capital a challenge.

■ **Fibre utilization:** The competitive advantage provided by the inherent

current and pending challenges. continued

natural qualities of Ontario's softwood fibre has been diminished by new technology and other global changes. For example: newsprint is losing ground to electronic communications media and changing world demand. Ontario hardwood fibre has been increasingly entering production but, this same technology favours production in countries with faster growing trees.

- **International trade:** The softwood trade dispute with the United States created an uncertain short-term investment environment and distorted the free-trade operating environment.

- **Yields:** In addition, Canada's timberlands and particularly those in eastern Canada have much lower yields produced over longer rotations than those in other jurisdictions with more favourable growing conditions.

Ontario also faces a number of internal challenges, which impact its ability to compete for market share and impact the profitability of operating:

- **Land Ownership (Tenure):** Ontario's forests are largely publicly owned, with 81% in public ownership. Public ownership introduces a degree of wood fibre supply uncertainty for

private companies operating on these lands. Canadian public policy balances this uncertainty by granting licensed tenure to forest companies to provide a secure fibre supply. Public holding of lands allows long-term strategic sustainable management of forests lands, which is uncommon globally. However, public ownership of these lands carries substantial regulatory requirements which can fetter innovation by subjecting forest management to a complex set of regulations and policies that have been created to conserve the public trust. This cannot be said about operations where companies or other investors own land outright and can concentrate on timber production as the sole goal for those lands. As a result, Ontario's forest lands do not provide investment opportunities which are available elsewhere in North America. U.S. based companies have been able to use their privately held timberlands as a source of capital. Large institutional investors have recently acquired substantial holdings of these lands. These institutional investors are able to take advantage of favourable tax benefits and other factors (e.g. conservation interests) to derive profits and raise capital for their purposes.

- **Workforce Demographics:** The average age of Ontario's workforce is increasing. Skilled labour is in high demand and is

being attracted to other industries. There is a drain of younger, mobile and skilled workers from northern Ontario who are willing to pursue opportunities in other locations. In addition, negative environmental campaigns, as well as attractive opportunities in competing professions and other environmental fields has led to a declining enrollment in forestry schools.

As a result, the Ontario forest products sector is going through: a period of capacity rationalization as high cost facilities are closed; increasing consolidation as companies attempt to grow to a size that enables them to compete globally; and, internal restructuring to reduce costs.

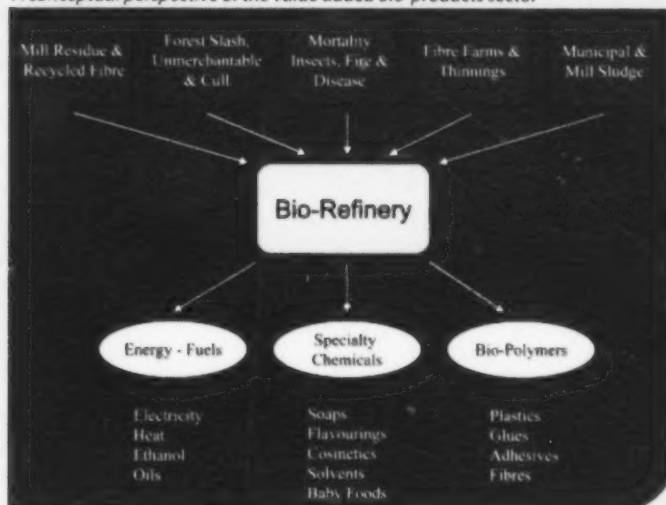
In response, the Ontario government has initiated substantial programs to facilitate new levels of investment, intended to address the long-term viability and sustainability of Ontario's forest industry.

Value-added products, such as engineered wood products and non-timber forest products and ecosystem services may represent areas of opportunity. However, such opportunities may be a challenge to realize for communities located far from markets. A new bio-economy using forest biomass is also an emerging market that includes bio-energy, bio-chemicals and bio-plastics as alternate uses of fibre.

Value-added products, such as engineered wood products, non timber forest products, ecosystem services and bio-materials may represent areas of opportunity.

Forest Bio-Products

A conceptual perspective of the value added bio-products sector



For over a century, Canada and other industrialized nations have relied on petrochemicals and fossil fuels to create many industrial products, including energy. The rising cost of fossil fuel extraction and a growing awareness of the environmental consequences of fossil fuel use is prompting industrialized nations to emphasize the use of renewable resources from solar, wind, water, forests, agriculture, and municipal wastes, in environmentally compatible ways. Forest companies and communities in Ontario are also beginning to acknowledge opportunities apparent in use and utility

of forest resources. Although the forest industry has been using residue from processing of lumber and pulp and paper products for energy and composite wood products for years, it has been slow to explore value-added opportunities derived from unused forest biomass, e.g., fuels/energy, specialty chemicals and polymers. The Ministry is helping set the stage for this type of exploration to occur.

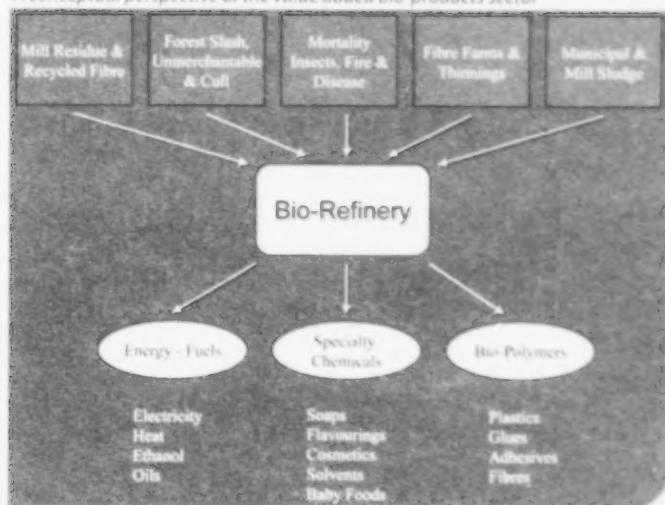
Forest biomass includes harvest residuals, residue from stand tending, natural disturbance mortality, and industrial waste. These resources, which are largely under utilized or disposed of today, could be used to produce bio-products: energy, enhanced fuels, specialty chemicals and bio-materials. The production systems for bio-products operate as an individual element of the harvest to market value chain or are integrated into infra-structure of existing forest product facilities. The socioeconomic benefits for rural communities and companies are significant.

Forest biomass is considered carbon neutral. Forest biomass emits the CO₂ incorporated during growth. The next generation of trees sequesters the CO₂ emitted – it is a closed loop. Fossil fuels are an open loop, adding to atmospheric CO₂ and contributing to global warming. Use of forest biomass for bio-products, allows for energy security and self-sufficiency in rural communities, creates economic development and job options, and promotes forest sector diversification. In all cases, the biomass utilization being considered does not contravene current guidelines for forest management operations.

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to summarize.

In delivering on its sustainable forest mandate Ontario faces numerous current and pending challenges.

In closing, this report finds that a number of the aspects of sustainable forest management in Ontario are positive, while other aspects exhibit room for improvement. The state or condition of Ontario's forests appears generally unchanged from that reported in the SOFR 2001. The forested land base and species composition are similar to that in 2001. The forest is being renewed after harvest. Disturbances are within the bounds of natural variation, and the harvest of timber and wildlife appears to be sustainable. The C&I framework that Ontario has adopted is progressive and reliant on data related to many different components of sustainability. Continued improvements in data availability and quality would positively impact the ability to evaluate and report on the sustainability of forest management practices and identify policy adjustment opportunities. The Ministry has developed forest management legislation and policies to help conserve ecosystem attributes over both short and longer time frames. It is less costly and more effective to anticipate and prevent negative environmental impacts before beginning

new activities, than it is to correct problems after the fact. The 'precautionary principle', when applied to forest management by the Ministry, is considered the best avenue to use to avoid errors made on the basis of outdated or incomplete information.

There are also a number of emerging challenges that the Ministry will need to monitor as discussed previously. The increasing globalization of trade increases the opportunity for the introduction of additional invasive alien species, which are an existing problem in southern Ontario. Trade globalization is also challenging the ability of Ontario's traditional commodity based forest industry to compete and is impacting the livelihood of forest resource-based communities. Opportunities exist for alternative uses and products derived from the forest. Ontario will need to seek these out and capitalize on them. Global environmental issues, such as climate change may profoundly affect Ontario's future forests and the Ministry's ongoing research collaboration in this field will assist in informing our future responses.

structural legacy following harvest

Biological legacies – surviving organisms (flora and fauna), and organically derived structures, such as snags, logs and soil organic layers are important features in the rapid reestablishment of forest ecosystems that have high levels of structural, functional and compositional diversity.



The ecological impacts of timber harvesting can be mitigated with forest management practices that contribute to the conservation of ecosystem diversity. Biological legacies – surviving organisms (flora and fauna), and organically derived structures, such as snags, logs and soil organic layers are important features in the rapid reestablishment of forest ecosystems that have high levels of structural, functional and compositional diversity.

Aspects of structural legacy or residual stand structure conserved in forest management activities include:

- Standing dead trees (snags, wildlife trees)

- Standing individual live trees
- Downed woody debris
- Internal and peninsular residual patches of living trees and
- Advanced regeneration and uneven-aged stand structure where appropriate

Scientific research on structural legacy was conducted during the period 1999-2004 including efforts to understand patterns of variation in response to geography (eco-regional variation), forest history (disturbance frequency, intensity and severity) and species/forest ecology.

snags

In excess of 44 vertebrate species in the boreal forest are known to use snags for cavity-nesting (woodpeckers, kestrels, some owls, waterfowl and songbirds) and for other mammals (such as marten, bats and flying squirrels) use them for denning and roosting habitat.

The size distribution and density of snags in clearcut and fire-disturbed boreal forests was investigated over a 24,000 km² area in northwestern Ontario. In general, the impacts of harvesting on snags was light in boreal forest conifer stands, and observed snag densities for Ontario's boreal mixedwood sites were within the range given for other boreal forest conditions. In contrast, snag resources were found to be negatively impacted in forests managed under the uneven-age selection silviculture system.

individual residual live trees

The retention of individual live trees at time of harvest provides structural legacy from the time of disturbance through the period of stand regeneration and into the crown closure and self-thinning stages of stand development. The ecological value of individual residual live trees compounds through time as the trees grow and age providing both future super-canopy structure and eventually dead snags.





residual patches

Direction for leaving specific residual patches within disturbances is provided in the *Forest Management Guidelines for the Provision of Moose Habitat* (OMNR 1988) which includes direction for temporary (± 10 years) leave patches between and among cut blocks. Similarly various other habitat guidelines (i.e. stream buffers, bald eagles nest buffers, etc.) ensure some leave patches within and among forest cut blocks and forest disturbances. Other residual patches are left following a clearcut where terrain prevents timber harvest.



advanced regeneration

Harvesting with advance regeneration protection is practiced in black spruce forest growing on peatlands within Ontario's claybelt. In this winter harvesting system, harvesting machines clearcut and travel in a five to seven metre wide strip and simultaneously reach for and extract trees of merchantable size from the adjacent five to nine metres of forest to each side. This approach retains a diversity of tree heights and diameters on the site following harvest.

Criteria and Indicator Framework

Criterion of Forest Sustainability	Elements of Forest Sustainability	Indicators of Forest Sustainability			
Criterion 1 Conserving Biological Diversity	Element 1.1 Conserving Ecosystem Diversity	1.1.1 Composition and structure of forest ecosystems (including old growth)	1.1.2 Fragmentation and connectedness of forest ecosystem components	1.1.3 Representation of ecological features by protected area category	1.1.4 Anthropogenic corridors, such as roads, utility corridors and railways
	Element 1.2 Conserving Species Diversity	1.2.1 Forest-associated species of conservation concern	1.2.2 Provincially featured and monitored forest-associated wildlife species	1.2.3 Invasive forest-associated species	
	Element 1.3 Conserving Genetic Diversity	1.3.1 Distribution and abundance of tree species of concern	1.3.2 Status number as an indicator of genetic diversity in seed orchards	1.3.3 Tree seed collection and use	
Criterion 2 Monitoring and Maintaining Forest Productivity and Resilience	Element 2.1 Monitoring and Modeling Forest Productivity	2.1.1 Forest growing stock indices	2.1.2 Net primary productivity		
	Element 2.2 Monitoring and Managing Incidences of Forest Disturbance	2.2.1 Fire and weather disturbance	2.2.2 Biotic disturbance - Insects and disease	2.2.3 Biotic disturbance - Invasive species	2.2.4 Anthropogenic disturbance (forest harvest)
	Element 2.3 Maintaining and Conserving Forest Ecosystem Resilience	2.3.1 Forest regeneration	2.3.2 Downed woody debris	2.3.3 Logging damage to residual trees and regeneration	
Criterion 3 Protecting and Conserving Ontario's Forest Soil and Water Resources	Element 3.1 Minimizing effects of forest management practices on forest soil resources	3.1.1 Compliance with soil protection guidelines			
	Element 3.2 Minimizing effects of forest management practices on water resources	3.2.1 Proportion of watersheds with stand-replacing disturbance	3.2.2 Compliance with forest management guidelines for protecting water quality	3.2.3 Compliance with forest management guidelines for protecting fish habitat	3.2.4 Watershed road and water crossing density

Criteria and Indicator Framework

Criteria and Indicator Framework

Criterion of Forest Sustainability	Elements of Forest Sustainability	Indicators of Forest Sustainability			
Criterion 4 Monitoring Forest Contributions to Global Ecological Cycles	Element 4.1 Managing Ontario's Forest Sector Contributions to Global Carbon Enrichment	4.1.1 Net carbon balance	4.1.2 Carbon dioxide emissions per unit of wood produced	4.1.3 Use of recycled versus virgin fibre	
	Element 4.2 Managing Conversion of Forest Land to Other Uses in Ontario	4.2.1 Area of deforestation (article 3.3 of the Kyoto Protocol)	4.2.2 Area of afforestation (article 3.3 of the Kyoto Protocol)		
	Element 4.3 Monitoring Nutrient Cycles in Ontario's Forests	4.3.1 Nitrogen cycling	4.3.2 Sulphur cycling		
	Element 4.4 Monitoring the Water Balance in Ontario's Forests	4.4.1 Evapotranspiration from Ontario's forests			
Criterion 5 Providing for a Continuous and Predictable Flow of Economic and Social Benefits from Ontario's Forests	Element 5.1 Maintaining or Enhancing the Resource Productive Capability of Ontario's Forest	5.1.1 Managed Crown forest area available for timber production	5.1.2 Habitat for selected wildlife species	5.1.3 Economic benefits from selected wildlife species	5.1.4 Sustainable annual removal of forest products
	Element 5.2 Monitoring and supporting Forest Sector Employment, Investment and Competitiveness	5.2.1 Rate of return by sector	5.2.2 Trends in forest-related employment	5.2.3 Capital and repair expenditures in forest-resource-based industries	5.2.4 Investment in research and technology development
	Element 5.3 Monitoring and supporting value added products and services	5.3.1 Green GDP related to forest-resource-based management activities	5.3.2 Trends in value-added wood products	5.3.3 Trends in value-added non-timber forest resources	5.3.4 Natural capital values
	Element 5.4 Maintaining or Enhancing Recreation, Tourism, and Other Social and Environmental Values Associated with the Forest.	5.4.1 Old growth	5.4.2 Opportunities for forest-based recreation and tourism	5.4.3 Identification and protection of cultural resources	

Criteria and Indicator Framework

Criterion of Forest Sustainability	Elements of Forest Sustainability	Indicators of Forest Sustainability		
Criterion 6 Accepting Social Responsibilities for Sustainable	Element 6.1 Respecting Aboriginal Rights and supporting Aboriginal Participation in Sustainable Forest Management Activities	6.1.1 Extent of Aboriginal participation in forest based economic opportunities	6.1.2 Aboriginal participation in the forest management planning process	6.1.3 Protection of Aboriginal spiritual values, cultural heritage, & traditional knowledge in

**Responsibilities
for Sustainable
Development**

**Participation Sustainable
Forest Management Activities**

opportunities

process

traditional knowledge in
Ontario's FMP process

Element 6.2

**Forest Community Wellbeing
and Resilience**

6.2.1

Resilience of forest-based
communities

Element 6.3

**Maintaining Fair and Effective
Public Participation in
Sustainable Forest
Management Decision-making**

6.3.1

Public consultation in the design
of new decision-making
processes

6.3.2

Fairness, effectiveness, and
public satisfaction with decision-
making processes and their
outcomes

**Criterion 7
Maintaining and
Enhancing
Ontario's
Framework for
Sustainable
Forest
Management**

Element 7.1

**Maintaining and Enhancing
Ontario's Legal Framework for
Sustainable Forest
Management**

7.1.1

Changes in laws, policies, and
regulations

Element 7.2

**Maintaining and Enhancing
Ontario's Institutional
Framework for Sustainable
Forest Management**

7.2.1

Forest management workforce
competency

7.2.2

Perception and knowledge of
forest managers concerning
public forest use and values

7.2.3

Forest access roads

7.2.4

Public review and consultation
infrastructure

Element 7.3

**Maintaining and Enhancing
Ontario's Economic Framework
for Sustainable Forest
Management**

7.3.1

Pricing system for forest
products

7.3.2

Private land forestry

Element 7.4

**Maintaining and Enhancing
Ontario's Monitoring
Framework for Sustainable
Forest Management**

7.4.1

Support provided by monitoring
programs for forest
management

7.4.2

Progress in inventory and
monitoring programs

7.4.3

Investment in forest-based
inventory and monitoring

7.4.4

Licensee compliance with
provincial forest mgmt.
legislation, policies & guidelines -
assessed through independent
audits

7.4.5

Compliance in forest operations
inspections

Element 7.5

**Maintaining and Enhancing
Ontario's Research and
Development Framework for
Sustainable Forest
Management**

7.5.1

Investment in forest-based
research and development

7.5.2

Investment in forest-based
knowledge and technology
transfer

SOFR on CD.

The State of the Forest Report, 2006 is a lengthy document and is included on the attached CD and at <http://www.mnr.gov.on.ca>

To use CD, insert into CD drive and navigate to index.html.

Some files on this CD are published in Adobe PDF format, for which the free viewer is available at: www.adobe.com

Panoramic QTVR pages are published in Quicktime format, for which the free view is available at: www.apple.com

Flash viewer available free at: www.adobe.com



The CD contains several hundred pages of additional content related to the criteria, elements and indicators as follows:

Chapter 1 contains background information necessary for understanding the various influences on the practice of sustainable forest management (SFM) in Ontario. Background information covers the legislation and policies that contribute to SFM, and the international, national, and Ontario context.

Chapter 2 contains a summary of the *Forest Resources of Ontario*, which characterizes Ontario's geography,

climate, and forest. This statistical compendium has been produced at five-year intervals since the 1920s.

Chapter 3 is a discussion of SFM assessment/evaluation. This is a continuation of the topic initiated in *SOFR 2001 Chapter 2*. This chapter is designed to meet the intent of the *Forest Resources Assessment Policy*, which requires the "development of methods to evaluate forest sustainability." The *EA Decision* required that this policy be updated every five years, most recently in 2003. The 2003 revision brought specific direction on the content for state of the forest reporting into Ministry policy.

Chapter 4 describes the hierarchical framework of criteria, elements, and indicators comprising Ontario's SFM evaluation framework.

The majority of the information on the CD is detailed information about the indicators presented in this chapter.

Chapter 5 presents a discussion of SFM implications.

Appendices including a glossary, list of acronyms, an index, a list of species names, an index to EA reporting requirements, and tables describing differences between the 2001 and 2006 reports